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TURNING/RECIPROCATING SWITCHING TYPE SHAKING DEVICE

Tadashi Umetsu

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TURNING/RECIPROCATING SWITCHING TYPE SHAKING DEVICE

[Senkai oyobi ofuku kirikaegata shindo sochi]

Inventor:

Tadashi Umetsu

Applicants:

Hayashi Kogyo K.K.
Iuchi Seieido K.K.

[There are no amendments to this patent.]

Claim

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A type of turning/reciprocating switching type shaking device characterized by the fact that it is composed of the following parts: a device's base plate having an eccentric ring driven by a driving source to perform eccentric rotation with a prescribed effective rotating radius and a Y-direction guide means set perpendicularly to the reciprocating shaking movement direction; an intermediate moving body that has an X-direction guide means set in the reciprocating shaking movement direction and is installed to slide freely in the Y-direction by said Y-direction guide means; a shaking table that has an actuating slot, which is formed through in the Y-direction

* [Numbers in the margin indicate pagination of the original text.]

corresponding to said effective rotating radius and has said eccentric ring inserted in it, and is installed to slide freely in the X-direction by said X-direction guide means; an actuating plate that has an engagement recession, which at least allows said eccentric ring engaged in the actuating slot, and is installed to slide freely in the X-direction with respect to said shaking table; and an actuating means that is connected to said actuating plate, and can have the engaging recession engaged and held to said eccentric ring or separated and released from it.

Detailed explanation of the invention

Industrial application field

This invention pertains to a type of turning/reciprocating switching type shaking device. More specifically, this invention pertains to improvement of a type of shaking device that can be used by switching between the turning and reciprocating shaking movement for the shaking table.

Prior art

In the prior art, for the purpose of incubation tests, etc., the object for culturing, that is, the culturing base, is contained together with the culturing solution in a beaker, flask, or other container. The container containing said test object is set in turning or reciprocating movement for shaking and agitation. In this case, a shaking device is adopted that can be switched between turning and reciprocating movement modes.

For the conventional turning/reciprocating switching type shaking device in the prior art, usually, a shaking table having an installing means for holding said container under prescribed conditions is prepared. The shaking table is connected as desired to the output end of a shaking driving source. For the shaking table of the shaking device with the aforementioned constitution, as explained above, while there should be two different modes of shaking for agitation, that is, turning and reciprocating movement, there is only one output end of the shaking driving source, and it is difficult to get the two modes of movement from it. Consequently, in the prior art, in order to realize the two modes of shaking, that is, turning shaking and reciprocating shaking, two different attachments are prepared. For these two attachments, two types of shaking tables are prepared. Each time the shaking mode is to be switched between turning shaking and reciprocating shaking, reconnection must be made to the output end of the shaking driving source.

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Problems to be solved by the invention

For the conventional shaking device with the aforementioned constitution, in order to realize the two shaking modes, that is the turning shaking and reciprocating shaking modes for

agitation, as explained above, each time selection and switching are performed between the turning shaking and reciprocating shaking modes, reconnection must be performed to the attachment for turning shaking or the attachment for reciprocating shaking, and the shaking table for setting the corresponding attachment also should be changed. Even when the individual connection state is simplified to the limit, the switching operation is still very complicated and tedious. Not only does the operation for switching not allow quick operation, one has to prepare the individual attachments and the corresponding shaking tables beforehand. This is also undesired.

The objective of this invention is to solve the aforementioned problems of the conventional methods by providing a type of turning/reciprocating switching type shaking device characterized by the fact that instead of setting two individual attachments for turning shaking and reciprocating shaking and two shaking tables corresponding to said attachments, it makes use of only a single shaking table for both turning shaking and reciprocating shaking connected to a single shaking driving source. As a result, while the single shaking table is connected to the shaking driving source as is, one can select either the turning shaking movement or the reciprocating shaking movement at will.

Means to solve the problems

In order to realize the aforementioned objective, the turning/reciprocating switching type shaking device of this invention has a selecting/switching means for selecting the turning shaking and reciprocating shaking for a single shaking table with a single shaking driving source. That is, the shaking table can work both as a turning shaking table and a reciprocating shaking table.

That is, this invention provides a type of turning/reciprocating switching type shaking device characterized by the fact that it is composed of the following parts: a device's base plate having an eccentric ring driven by a driving source to perform eccentric rotation with a prescribed effective rotating radius and a Y-direction guide means set perpendicularly to the reciprocating shaking movement direction; an intermediate moving body that has an X-direction guide means set in the reciprocating shaking movement direction and is installed to slide freely in the Y-direction by said Y-direction guide means; a shaking table that has an actuating slot, which is formed through in the Y-direction corresponding to said effective rotating radius and has said eccentric ring inserted in it, and is installed to slide freely in the X-direction by said X-direction guide means; an actuating plate that has an engagement recession, which at least allows said eccentric ring engaged in the actuating slot, and is installed to slide freely in the X-direction with respect to said shaking table; and an actuating means that is connected to said

actuating plate, and can have the engaging recession engaged and held to said eccentric ring or separated and released from it.

Operation

Consequently, according to this invention, on the device's base plate, the intermediate moving body is installed such that it can slide freely in the Y-direction via the Y-direction guide means, and the shaking table is installed on the intermediate moving body such that it can slide freely in the X-direction via the X-direction guide means. As a result, the shaking table can make 2-dimensional freely sliding movement in the X- and Y-directions with respect to the device's base plate. Also, in this state, the eccentric ring set on the device's base plate and driven to make eccentric rotating movement is inserted in the actuating slot formed through in the Y-direction of the shaking table, and at the same time, by means of the engaging recession of the actuating plate installed in free sliding way in the X-direction on the shaking table, the eccentric ring can be engaged and held in the actuating slot, or separated and released from it. Consequently, by engaging and holding the eccentric ring in the engaging recession, the Y-direction sliding of the eccentric ring in the actuating slot can be prevented, and the shaking table can be driven to make turning shaking movement. On the other hand, when it is separated and released, the eccentric ring can make the Y-direction sliding in the actuating slot, and the Y-direction sliding of the intermediate moving body is stopped, so that the shaking table is driven to make X-direction reciprocating shaking movement.

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Application examples

In the following, a detailed explanation will be given for an application example of the turning/reciprocating switching type shaking device of this invention with reference to Figures 1-4.

Figure 1 is a plan view illustrating the schematic constitution of the turning/reciprocating switching type shaking device in this application example in the turning shaking state. Figure 2 is a side view illustrating the constitution of said device. Figure 3 is a cross-sectional view taken across [line] III-III of Figure 1.

In the constitution of the device illustrated in the figures of this application example, (1) represents the base plate of the device. Said base plate (1) is fixed and supported via individual columns (4) on device base (2) that has appropriate vibration-proof seat (3) or the like set so as to absorb the vibration. On said base plate (1), speed-changeable motor (5) having first-stage pinion (6) is set as the shaking driving source, and, at the same time, it has second-stage large gear (8) pivoted on intermediate shaft (7) and engaged to first-stage pinion (6), third-stage small gear (9) set coaxial to said second-stage large gear, and fourth-stage (last stage) large gear (11) pivoted

on spindle (10) and engaged to third-stage small gear (9). These gears are engaged to each other and form a speed reducing gear train. On the upper portion of last-stage large gear (11), at a position of a prescribed radius (r_1) from the rotating center, eccentric ring (12) is pivoted in a freely rotating way as the output end for realizing the two different modes of shaking, that is, turning shaking and reciprocating shaking.

In the constitution on the driving side on said base plate (1), along with the rotating driving of speed-changeable motor (5) as the shaking driving source, the speed is reduced to the prescribed rotating velocity via the speed reducing gear train, and eccentric ring (12) as the output end makes eccentric rotation at a prescribed radius of rotation (r_1).

On the other hand, in this application example, with respect to said base plate (1), among the various shaking modes, corresponding to the direction perpendicular to the movement detect of the reciprocating shaking mode (in the following, the direction perpendicular to the reciprocating shaking movement direction will be referred to as "Y direction," and the direction parallel to the reciprocating shaking movement direction will be referred to as "X direction"), a pair of Y-direction guide rods (13), (13) are installed laterally as they occupy the upper positions on the two sides on the plate surface and are fixed and supported with fixing frames (14), (14) at the two end portions, respectively.

Also, (15) represents the intermediate moving body. Said intermediate moving body (15) has frame plates (16), (16) as a group set on the two sides corresponding to said Y-direction, and a pair of X-direction guide rods (17), (17) on the two sides between said X-direction. Said X-direction guide rods (17), (17) are carried in the direction corresponding to said X-direction between the two ends portions of said frame plates (16), (16), respectively, to assemble a frame structure. At the same time, from each of the outer side surfaces of said frame plates (16), (16), guide rollers (18), (18) as a group corresponding to said Y-direction are pivoted protruding and corresponding to said Y-direction.

For said intermediate moving body (15), corresponding to said Y-direction guide rods (13), (13), it is carried such that it is held from upper/lower sides with groups of guide rollers (18), (18) of each of frame plates (16), (16), so that it can slide freely in the Y-direction on Y-direction guide rods (13), (13).

(19) represents the shaking table formed in flat plate shape. On the plate surface of said shaking table (19), in order to realize said two different shaking modes, that is, turning shaking and reciprocating shaking, actuating slot (20) corresponding to radius (r_1) assigned to eccentric ring (12) as the output end and having a major diameter (r_2) a little larger than the effective rotation radius, that is, an effective major diameter ($2r_1 + \Delta r_1$) (where Δr_1 is the tolerable spacing) is formed through along said Y direction so that at least one end portion (the right end in the example shown in Figure 1) is positioned on the central line of said X-direction. Also on

the two sides corresponding to said X-direction, guide rollers (21), (21) as a group are pivoted and protruding. For said shaking table (19), said eccentric ring (12) is inserted and received in actuating slot (20), and at the same time, said X-direction guide rods (17), (17) are carried out such that they are held from upper/lower sides with said groups of guide rollers (21), (21). As a result, the shaking table can make free sliding in X-direction on said X-direction guide rods (17), (17).

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For the carrying structure of shaking table (19) via intermediate moving body (15) on said device's base plate (1), movement can be made in 2-dimensional directions of X and Y on the horizontal plane. That is, intermediate moving body (15) can slide in Y-direction with respect to device's base plate (1), and shaking table (19) can slide in X-direction with respect to intermediate moving body (15). As a result, as sliding in said two directions of X and Y are combined, shaking table (19) can make independent free sliding movement in a prescribed range in the 2-dimensional directions on the horizontal plane.

With respect to said shaking table (19), guide groove (22) is formed as recession on the inner surface side to hold the through portion of actuating slot (20), and relief slot (23) is formed through in a portion. In said guide groove (22), actuating plate (24) having actuating axial pin (25) set on it corresponding to the formation position of relief slot (23) is pressed by a group of pressing plates (26), (26) and it is installed in a freely sliding way.

Also, with respect to said actuating plate (24), on the side facing said eccentric ring (12), two side guide cam slopes (27), (27) that expand and face said eccentric ring and engaging recessions (28) at the ends of the cam slopes are formed, and at the same time, on said base plate (1), on the side facing engaging rod (29) planted and fixed on the same line in X-direction with respect to spindle (10), similarly, two side guide cam slopes (30), (30) that expand and face said engaging rod and engaging recessions (31) at the ends of the cam slopes are formed. Also, on the inner side of said shaking table (19), switching actuating lever (33) pivoted by pivot pin (32) is set with one end portion protruding to the outside of shaking table (19). By engaging slot (34) formed through on the other end portion of said switching actuating lever (33) to said actuating shaft pin (25), it is possible to perform a rocking operation. In the selected operation state on the side indicated by the solid line in the figure (turning shaking side switching point A), positioning of engaging recession (31) with respect to said engaging rod (29) is released, and at the same time, engaging recession (28) is engaged to said eccentric ring (12) via guide cam slopes (27), (27), so that eccentric ring (12) can be kept at the inserting position in said actuating slot (20) (as to be explained later, the guaranteed position in this state corresponds to the turning shaking position of shaking table (19)).

On the other hand, in the actuating state on the side indicated by the double-dot-dash line in the figure (reciprocating shaking side switching point B), engagement of eccentric ring (12) in

said actuating slot (20) is released, and, at the same time, via guide cam slopes (30), (30), engaging recession (31) is temporarily engaged to said engaging rod (29). As a result, with respect to said base plate (1), the main body of said shaking table (19) has its X-direction central line position pulled to the prescribed position on base plate (1), that is, it is pulled to the prescribed position in agreement with the X-direction central line passing through spindle (10) as the rotating center of eccentric ring (12), and it is then positioned (the pull-up position in this state corresponds to the reciprocating shaking position of shaking table (19) as to be explained later). However, in this case, as far as the pull-up position is concerned, along with the later start of the reciprocating shaking movement in X-direction, the Y-direction position is temporarily guaranteed. However, it does not mean that fixed engagement itself is performed at this position.

In this case, the X-direction central line of shaking table (19) is set in agreement with the rotation center of eccentric ring (12) on device's base plate (1). This is to move shaking table (19) to the central portion of the device so as to facilitate use during the reciprocating shaking, and, at the same time, to improve the appearance. On the other hand, setting of the acting force point of reciprocating shaking at the X-direction central portion of shaking table (19) is for ensuring the mass balance of shaking table (19) itself. However, when these facts may not be taken into consideration, there is no need to have a means for positioning to said engaging rod (29) by means of engaging recession (31) and for moving and pull-up to the central portion. In this case, the role of switching actuating lever (33) may be limited only to engagement and restraining as well as separation and releasing of engaging recession (28) to eccentric ring (12). Also, in order to ensure positioning and guarantee of switching actuating lever (33) at switching points A, B on the turning shaking side and reciprocating shaking side, for example, one may set a restraining mechanism, lock mechanism, etc. as needed so that there is no loosening due to vibration along with turning and reciprocating shaking. /5

In the figure, (35) represents a detecting plate of the encoder set coaxial to said spindle (10). By means of an appropriate detecting means not shown in the figure, the rotating velocity of spindle (10) and thus the rotating velocity of eccentric ring (12) are detected, and the turning velocity and reciprocating velocity when turning shaking and reciprocating shaking are displayed as a digital signal.

Consequently, in the device of this application example with the aforementioned constitution, along with the rotation driving of variable speed motor (5) as the shaking driving source, speed reduction is performed by means of the speed reducing gear train so as to increase the output power. Eccentric ring (12) as the output end is driven to make eccentric rotation with a prescribed rotation radius (r_1). In this case, switching actuating lever (33) is selectively switched to turning shaking switching point A. On one hand, positioning by means of engaging recession (31) of actuating plate (24) with respect to engaging rod (29) on base plate (1) is released, and

the relationship between the two parts is released. On the other hand, by means of engaging recession (28) of actuating plate (24), eccentric ring (12) inserted in actuating slot (20) is restrained at the inserting position, that is, the middle position in actuating slot (20), and this restraining position is guaranteed. Consequently, said eccentric ring (12) is substantially in a state in which it is engaged freely for rotation only at the prescribed position of shaking table (19). As a result, in this state, Y-direction sliding of intermediate moving body (15) with respect to base plate (1) and X-direction sliding of shaking table (19) with respect to said intermediate moving body (15) are combined, so that shaking table (19) is driven to make rotating movement around spindle (10) with an effective radius (r_1), that is, to make turning shaking movement.

Also, when switching actuating lever (33) is selectively switched to reciprocating shaking side switching point B, on one hand, engagement and restraining by means of engaging recession (28) of actuating plate (24) with respect to eccentric ring (12) in actuating slot (20) is released, and the two parts are separated from each other. On the other hand, in this state, engaging rod (29) on base plate (1) is positioned and pulled-up by means of engaging recession (31) of actuating plate (24), and the pull-up position is guaranteed. Consequently, said shaking table (19) is substantially in the X-direction slidable state with respect to base plate (1), while Y-direction sliding alone is blocked. For the Y-direction, eccentric ring (12) in the released state can slide freely only in actuating slot (20) formed through with an effective major diameter of $(2r_1 + \Delta r_1)$ along the Y-direction. In this state, although intermediate moving body (15) cannot slide in Y-direction with respect to device's base plate (1), the X-direction sliding of shaking table (19) with respect to said intermediate moving body (15) and the Y-direction sliding of eccentric ring (12) in actuating slot (20) are nevertheless combined. As a result, shaking table (19) makes reciprocating movement only in X-direction, with the X-direction cross points on the rotating circle locus (with diameter of $2r_1$) of eccentric ring (12) as the turning points, respectively. That is, it can make reciprocating shaking movement.

In the following, explanation will be made on switching operation from said turning shaking movement state to the reciprocating shaking movement state. At any stop position of the turning shaking movement, while still connected to shaking table (19), switching actuating lever (33) held at turning shaking side switching point A is switched to reciprocating shaking side switching point B. As a result, along with the sliding movement of actuating plate (24) in the direction indicated by arrow a in guide groove (22), first of all, on the side of shaking table (19), engagement of engaging recession (28) for eccentric ring (12) in actuating slot (20) is released, and the two parts are separated from each other. At the same time, at least a portion of engaging rod (29) on base plate (1) becomes in contact with certain portion on engaging guide cam slope (30). While the contact surface is guided on said engaging rod (29), shaking table (19) is pulled to move until the line connecting spindle (10) and engaging rod (29), and, after engaging

recession (28) is pulled out from eccentric ring (12), engaging recession (31) is temporarily engaged to said engaging rod (29). In this way, in a very simple operation, it is possible to switch to the reciprocating shaking movement state.

On the contrary, the operation for switching from said reciprocating shaking movement to the turning shaking movement is performed as follows. At the stop position of the reciprocating shaking movement, switching actuating lever (33) held on the reciprocating shaking side switching point B is switched to turning shaking side's switching point A. As a result, in company with sliding movement of actuating plate (24) in the direction indicated by arrow b, the relationship of engaging recession (31) with respect to engaging rod (29) is released. In this state, even when the pull-up position at the stop time deviates, just as explained in the above, certain portion of engaging guide cam slope (27) is in contact with at least a portion of eccentric ring (12) in actuating slot (20) on shaking table (19). As the contact surface is guided on eccentric ring (12), engaging recession (28) is engaged in said eccentric ring (12), and this engagement state can be restrained and guaranteed. In this way, it is also possible to switch to the turning shaking movement state with a very simple operation.

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Effect of the invention

As explained in detail above, the device of this invention has the following parts: a base plate having an eccentric ring driven by a driving source to perform eccentric rotation with a prescribed effective rotating radius and a Y-direction guide means set perpendicularly to the reciprocating shaking movement direction; an intermediate moving body that has an X-direction guide means set in the reciprocating shaking movement direction and is installed to slide freely in the Y-direction by said Y-direction guide means; a shaking table that has an actuating slot, which is formed through in the Y-direction corresponding to said effective rotating radius and has said eccentric ring inserted in it, and is installed to slide freely in the X-direction by said X-direction guide means; an actuating plate that has an engagement recession, which at least allows said eccentric ring to engage in the actuating slot, and is installed to slide freely in the X-direction with respect to said shaking table; and an actuating means that is connected to said actuating plate, and can have the engaging recession engaged and held to said eccentric ring or separated and released from it. Consequently, the shaking table can make free 2-dimensional sliding movement in the X and Y directions with respect to the base plate of the device. Also, by means of engagement and holding of the eccentric ring in the engaging recession, the X-direction sliding of the eccentric ring in the actuating slot can be prevented, and the shaking table can make reciprocating shaking movement. Also, when the eccentric ring is released from the engaging recession, the Y-direction sliding of the eccentric ring in the actuating slot is allowed, while the Y-direction sliding of the intermediate moving body is stopped, so that the shaking

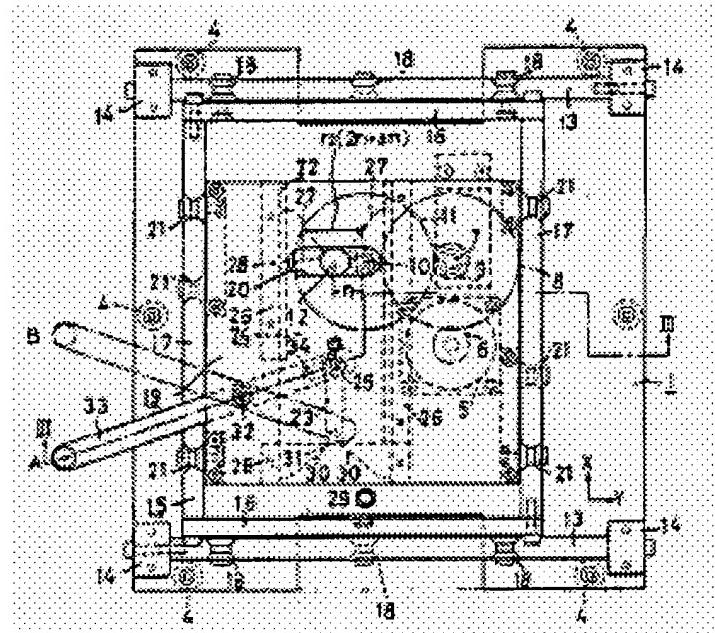
table can make X-direction reciprocating shaking movement. As a result, by simply selectively switching the actuating plate, one can easily and quickly perform the two different modes of shaking movement, that is, turning shaking movement and reciprocating shaking movement using the same shaking table. Consequently, there is no need to prepare different attachments and different shaking tables corresponding to the attachments and to reconnect them each time when switching is to be made between the turning shaking movement and the reciprocating shaking movement as would be needed in the prior art. Also, the structure of the device of this invention is rather simple, and it can be embodied easily. This is also an advantage.

Brief description of the figures

Figure 1 is a plan view illustrating the schematic constitution of the turning/reciprocating switching type shaking device of this invention in the turning shaking mode. Figure 2 is a side view of said device. Figure 3 is a cross-sectional view taken across III-III in Figure 1.

- 1 Base plate of the invention
- 5 Motor
- 6-11 Speed reducing gear train
- 10 Spindle
- 12 Eccentric ring
- 13 Y-direction guide rod
- 15 Intermediate moving body
- 16 Frame plate
- 17 X-direction guide rod
- 18 Y-direction guide rod
- 19 Shaking table
- 20 Actuating slot
- 21 X-direction guide roller
- 22 Guide groove
- 24 Actuating plate
- 25 Actuating shaft pin
- 26 Pressing plate
- 27 Engaging guide cam slope
- 28 Engaging recession
- 29 Engaging rod
- 30 Engaging guide cam slope
- 31 Engaging recession

- 32 Pivot pin
 33 Switching actuating lever
 A Turning shaking side's switching point
 B Reciprocating shaking side's switching point
 r₁ Rotation radius of eccentric ring
 r₂ Long diameter of actuating slot
 Δr₁ Allowed gap



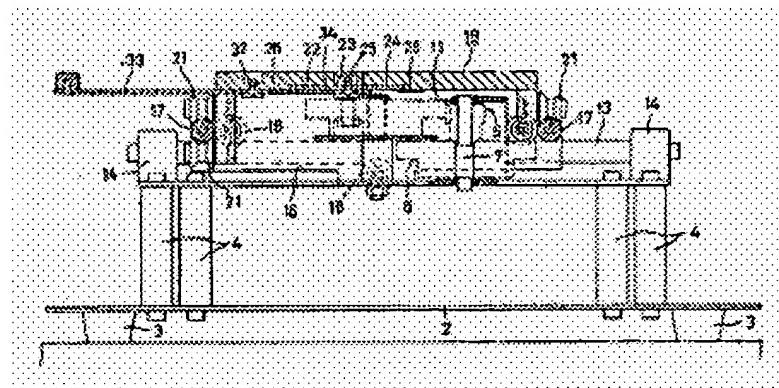


Figure 3

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⑪ 特許出願公開

⑫ 公開特許公報 (A)

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⑮ 発明の名称 旋回および往復切換型振盪装置

⑯ 特 願 平1-81900

⑰ 出 願 平1(1989)3月31日

⑱ 発明者 梅津司 栃木県那須郡西那須野町三島4-27

⑲ 出願人 林工業株式会社 東京都大田区雪谷大塚町1-3

⑳ 出願人 株式会社井内盛栄堂 大阪府大阪市北区天満4丁目10番15号

㉑ 代理人 弁理士菅 隆彦

明細書

3. 発明の詳細な説明

(産業上の利用分野)

本発明は、旋回および往復切換型振盪装置に關し、さらに詳しく述べては、振盪台を旋回および往復の何れかの振盪運動に切換えて使用する振盪装置の改良に係るものである。

(従来の技術)

例えば、培養試験などのために、ビーカー、フラスコなどの収納容器内に、培養液などと一緒に培養基、つまり、被試験物を収納させた上で、この被試験物を収納容器毎、旋回または往復運動させて振盪搅拌させるためには、従来からよく知られているように、旋回および往復切換型の振盪装置が使用される。

ところで、従来例によるこの種の旋回および往復切換型振盪装置は、一般に、前記収納容器を特定の条件下で保持する装置手段を装着させてなる振盪台を用意しておき、1つの振盪駆動源の出力端に、この振盪台を所期通りに連繋結合させた構成になつており、このように構成される振盪装置

1. 発明の名称

旋回および往復切換型振盪装置

2. 特許請求の範囲

駆動源により所定の有効回転半径で偏心回転駆動される偏心輪、および往復振盪運動方向に直交して配設されるY方向ガイド手段を有する装置基板と、往復振盪運動方向に配設されるX方向ガイド手段を有して、前記Y方向ガイド手段によりY方向摺動自在に裝架される中間遊動体と、前記有効回転半径に対応してY方向に空設され、前記偏心輪を嵌挿させる作動長孔を有して、前記X方向ガイド手段によりX方向摺動自在に裝架される振盪台と、少なくとも前記偏心輪を作動長孔内で係合し得るようにした係合凹部を有して、前記振盪台に対してX方向摺動自在に装着される作動板と、前記作動板に連繋されて、前記偏心輪に係合凹部を係合保持、または離脱解放させる作動手段とを備えて構成したこととする旋回および往復切換型振盪装置。

の振盪台に対して、前記したように、旋回または往復運動の2種類の異なる振盪機拌作用を与えるには、振盪駆動源の出力端が1つであつて、これから2種類の動作を引き出すのは困難であることから、通常の場合、旋回振盪用と往復振盪用との2種類、各別2個のアタッチメントを用いるか、あるいは、これらの各アタッチメントを各別に付設させた2種類、各別2台の振盪台を用い、装置での旋回振盪および往復振盪の選択切換えの度毎に、これらを振盪駆動源の出力端に個別に連繋結合し直して使用するようしている。

(発明が解決しようとする課題)

しかしながら、前記構成による従来の振盪装置においては、旋回または往復運動の2種類の異なる振盪機拌作用を得るために、前記した如く、その旋回振盪および往復振盪の選択切換えの度毎に、振盪駆動源の出力端に対して、旋回振盪用と往復振盪用との各アタッチメント、あるいは、各アタッチメントを付設させた各振盪台を一々に連繋結合し直して使用しなければならず、たとえ、

前記目的を達成するために、本発明に係る旋回および往復切換え型振盪装置は、1台の振盪台に対し、1つの振盪駆動源への旋回振盪、往復振盪の選択切換え手段を設けて、これを旋回振盪、往復振盪兼用の振盪台として用い得るようにしたものである。

すなわち、本発明は、駆動源により所定の有効回転半径で偏心回転駆動される偏心輪、および往復振盪運動方向に直交して配設されるY方向ガイド手段を有する装置基板と、往復振盪運動方向に配設されるX方向ガイド手段を有して、前記Y方向ガイド手段によりY方向摺動自在に装架される中間遊動体と、前記有効回転半径に対応してY方向に穿設され、前記偏心輪を嵌挿させる作動長孔を有して、前記X方向ガイド手段によりX方向摺動自在に装架される振盪台と、少なくとも前記偏心輪を作動長孔内で係合し得るようにした係合凹部を有して、前記振盪台に対してX方向摺動自在に装着される作動板と、前記作動板に連繋されて、前記偏心輪に係合凹部を係合保持、または離

個々の連繋結合の態様を可及的に簡略化したとしても、その付け替え操作が極めて煩雑かつ面倒であり、切換えに手間取つて迅速性に欠けるばかりか、個別の各アタッチメント、あるいは、各アタッチメントを付設させた各振盪台を、予めそれぞれに準備しておくこと自体にも問題があるなどの不都合を避けられないものであった。

本発明は、従来のこののような問題点を解消するためになされたもので、その目的とするところは、旋回振盪用と往復振盪用との各別2個のアタッチメント、あるいは、これらの各アタッチメントを付設させた各別2台の振盪台を用いることなく、1つの振盪駆動源に対して、旋回振盪、往復振盪兼用の1台の振盪台を連繋させ、この1台の振盪台を振盪駆動源側に連繋させたまゝで、旋回振盪運動、または往復振盪運動の何れかを任意に選択して切換え使用し得るようにした、この種の旋回および往復切換え型振盪装置を提供することである。

(課題を解決するための手段)

脱解放させる作動手段とを備えて構成したことを特徴とする旋回および往復切換え型振盪装置である。

(作用)

従つて、本発明においては、装置基板上にY方向ガイド手段を介して中間遊動体をY方向摺動自在に、中間遊動体にX方向ガイド手段を介して振盪台をX方向摺動自在にそれぞれ装架させてあるので、装置基板に対して振盪台をX、Yの2次元方向へ自由に摺動させることができ、また、この状態で、装置基板上に設けられて偏心回転駆動される偏心輪を、振盪台のY方向に穿孔された作動長孔に嵌挿せると共に、振盪台にX方向で摺動自在に装着される作動板の係合凹部により、作動長孔内に偏心輪を係合保持、または離脱解放せ得るようにしたから、係合凹部による偏心輪の係合保持によつては、作動長孔内での偏心輪のY方向摺動を阻止して、振盪台に旋回振盪運動を与えることができ、離脱解放によつては、作動長孔内での偏心輪のY方向摺動を許容し、かつ中間遊動

体のY方向摺動を絶つて、振盪台にX方向の往復振盪運動を与えることができる。

(実施例)

以下、本発明に係る旋回および往復切換型振盪装置の一実施例につき、第1図ないし第4図を参照して詳細に説明する。

第1図は本実施例を適用した旋回および往復切換型振盪装置の概要構成を旋回振盪状態で示す平面図であり、また、第2図は同上装置構成の側面図、第3図は第1図Ⅲ-Ⅲ線部における断面図である。

すなわち、これらの実施例各図の装置構成において、符号1は装置基板を示し、この装置基板1は、適宜に防振座3などを配して振動吸収し得るようにした装置基台2上に、個々の支柱4を介して固定支持されており、この装置基板1上には、振盪駆動源としての第1段ピニオン6を有する可変速モーター5が設置されると共に、中間軸7上に枢支されて第1段ピニオン6に噛合される第2段大歯車8、およびこれと同軸にされた第3段小

面上での両側の各上部位置を占め、それぞれに両端部を固定駒14、14によって固定支持させた一対からなるY方向ガイドロッド13、13が横架されている。

また、15は中間遊動体を示し、この中間遊動体15は、前記Y方向に相当する両側での一組からなる枠板16、16と、前記X方向に相当する両側の一対からなるX方向ガイドロッド17、17とを有しており、これらの各X方向ガイドロッド17、17が、各枠板16、16のそれぞれ両端部間にあつて、前記X方向に対応する方向で横架されるようにして枠状に組上げると共に、これらの各枠板16、16の外側面からは、前記Y方向に対応してそれぞれに一組づゝの各ガイドローラー18、18を突出枢支させて構成する。

そして、前記中間遊動体15については、これを、前記各Y方向ガイドロッド13、13に対して、各枠板16、16の各組のガイドローラー18、18を用いて上下から挟持するようにして載架させることで、これらの各Y方向ガイドロッ

ト車9と、主軸10上に枢支されて第3段小歯車9に噛合される第4段(最終段)大歯車11とが配置され、これらの相互に噛合される各歯車によつて減速歯車列を構成し、かつ最終段大歯車11の上面にあつて、その回転中心から所定の半径(r_1)を隔てた位置に、旋回または往復運動の2種類の異なる振盪攪拌作用を得るための出力端となる偏心輪12を可回転的に枢支させてある。

仍つて、この装置基板1上での駆動側の構成においては、振盪駆動源となる可変速モーター5の回転駆動に伴ない、減速歯車列を介して所定の回転数まで減速された出力端となる偏心輪12が、所定の回転半径(r_1)で偏心回転されることになる。

一方、前記装置基板1に対しては、本実施例の場合、各振盪作用のうち、往復振盪作用の運動方向に直交する方向(こゝでは、以後、この往復振盪作用の運動方向に直交する方向を“Y方向”と呼び、同様に、往復振盪作用の運動方向に平行する方向を“X方向”と呼ぶ)に対応して、その板

ド13、13上をY方向に向け自由に摺動し得るようにしてある。

さらに、19は平板状に形成された振盪台を示し、この振盪台19の板面上には、前記した旋回または往復運動の2種類の異なる振盪攪拌作用を得るための、出力端としての偏心輪12に与えられている半径(r_1)に対応して、その有効回転径よりも僅かに大きくした長径(r_2)、つまり、有効長径($2r_1 + \Delta r_1$)、(こゝで、 Δr_1 は許容間隙である)の作動長孔20が、少なくともその一方の端部(第1図において右端)側を板面での前記X方向の中心線上に位置されるようにして前記Y方向に沿つて穿孔され、かつ前記X方向に相当する両側にあつて、一組づゝの各ガイドローラー21、21が突出枢支されており、この振盪台19は、作動長孔20内に前記偏心輪12を嵌挿させて受入れると共に、各組のガイドローラー21、21により前記各X方向ガイドロッド17、17を上下から挟持するようにして載架させることで、これらの各X方向ガイドロッド17、17上をX方

向に向け自由に摆動し得るようにしてある。

仍つて、この装置基板1での中間遊動体15を介した振盪台19の載架構成においては、水平面におけるX、Yの2次元方向にあつて、装置基板1に対して中間遊動体15がY方向に摆動可能となり、かつ中間遊動体15に対して振盪台19がX方向に摆動可能となるもので、結果的には、これらのX、Y2方向の各摆動可能な態様が複数されて、振盪台19を独立させて水平面2次元方向の所定範囲内で自由に摆動移動させ得ることになる。

さらにまた、前記振盪台19に対しては、その裏面側にあつて、作動長孔20の穿孔部分を挟むようにガイド凹溝22が凹設して形成され、かつ一部に逃げ溝23を穿設させてあり、このガイド凹溝22内には、逃げ溝23の形成位置に対応して作動軸ピン25を配設した作動板24が、一組の押え板26、26により押止されて摆動自在に装着されている。

かつまた、前記作動板24に対しては、前記偏

て確保させ得る（この状態での確保位置は、後述するように、振盪台19の旋回振盪位置に相当する）のである。

そしてまた、2点鎖錠図示側に作動させた状態（往復振盪側切換え点B）では、この作動長孔20内の偏心輪12に対する係合が解除されると共に、ガイドカム斜面30、30を経て、前記係止ロッド29に係止凹部31を一旦、係止せることによつて、前記装置基板1に対し、この振盪台19自体を、そのX方向中心線位置が装置基板1上の所定位置、つまりこゝでは、偏心輪12の回転中心である主軸10を通るX方向中心線に可及的に一致させた所定位置に引寄せて一旦、位置決めさせ得る（この状態での引寄せ位置は、後述するように、振盪台19の往復振盪位置に相当する）のである。しかし、この場合、引寄せ位置については、その後のX方向への往復振盪運動の開始に伴ない、Y方向位置こそ一旦、確保されはするものの、その位置で引留め係止自体がなされるものでないことは勿論である。

心輪12に対向する側にあつて、これに向けて拡開された両側のガイドカム斜面27、27および各カム斜面終端の係合凹部28が形成されると共に、前記装置基板1上にあつて、主軸10とX方向同一線上で直立固定させた係止ロッド29に対する側にあつて、同様に、これに向けて拡開された両側のガイドカム斜面30、30および各カム斜面終端の係止凹部31が形成されており、さらにまた、前記振盪台19の裏面側には、支点軸ピン32によつて枢支された切換え作動レバー33が、一端部を振盪台19の外側に突出させて配設され、この切換え作動レバー33の他端部に穿設された長孔34を前記作動軸ピン25に係合させることで、摆動操作可能にしてあつて、これを実線図示側に選択的に作動させた状態（旋回振盪側切換え点A）では、前記係止ロッド29に対する係止凹部31の位置決めが解除されると共に、ガイドカム斜面27、27を経て、前記偏心輪12に係合凹部28を係合させて、前記作動長孔20内の偏心輪12をその嵌挿位置に保持し

こゝで、この場合、装置基板1での偏心輪12の回転中心に対して、振盪台19のX方向中心線を可及的に一致させるのは、往復振盪に際し、振盪台19を装置の中心部分に移動させて使用勝手を良好にさせると共に、併せて、見た目の外観を良好にさせるためと、往復振盪の作用力点を振盪台19のX方向中心部分におくことで、振盪台19自体の質量バランスを良好に保持させるためとであつて、これらの事柄を考慮しなくて済む場合には、このような係止ロッド29への係止凹部31による位置決め、および中心部分への移動引寄せのための手段を必ずしも必要とせず、切換え作動レバー33の役割をして、偏心輪12への係合凹部28の係合拘束、および離脱解放のみに限定しても差し支えはない。また、切換え作動レバー33の旋回振盪側および往復振盪側の各切換え点A、Bでの位置保持とその確保については、例えば、これが旋回、往復の各振盪作用に伴なつて生ずる振動などによつて緩んだりすることのないようにするために、適宜、必要に応じて、節度機

構またはロック機構などを付設させることを妨げない。

なお、図中、符号35は、前記主軸10と同軸に設けられたエンコーダの検知板であつて、図示省略した適当する検知手段により、主軸10、ひいては、偏心輪12の回転数を検出して旋回振盪または往復振盪時における旋回数または往復数をそれぞれにディジタル表示するために用いるものである。

従つて、前記のように構成される本実施例装置においては、振盪駆動源となる可変速モーター5の回転駆動に伴ない、減速歯車列を用いた減速により出力パワーをアップさせた上で、出力端としての偏心輪12を所定の回転半径(r_1)によつて偏心回転させるが、このとき、切換え作動レバー33が旋回振盪側切換え点Aに選択切換えられると、一方では、装置基板1上の係止ロッド29に対する作動板24の係止凹部31による位置決めが解除されて、これらの両者間の関係が絶たれた状態にあり、かつ他方、作動板24の係合

上、この振盪台19は、装置基板1に対して、そのX方向摺動が可能な状態で、Y方向摺動のみが可及的に封じられることになると共に、このY方向については、解放状態にある偏心輪12が、Y方向に沿い有効長径($2r_1 + \Delta r_1$)で穿孔された作動長孔20内においてのみ摺動自在な状態におかれるので、この状態では、装置基板1に対する中間遊動体15のY方向摺動がなされないが、この中間遊動体15に対する振盪台19のX方向摺動と、作動長孔20内の偏心輪12のY方向摺動とが複合されて、偏心輪12の回転円軌跡(直径 $2r_1$)上におけるX方向交叉点をそれぞれの折返し点として振盪台19をX方向にのみ往復運動、すなわち、往復振盪運動させることができるのである。

しかしして、前記旋回振盪運動状態からの往復振盪運動への切換え作動については、旋回振盪運動での停止位置の如何に拘らず、同停止位置において、振盪台19に連繋された状態で、旋回振盪側切換え点Aに保持されている切換え作動レバー

凹部28によつて作動長孔20内に嵌挿されている偏心輪12が、その嵌挿位置、こゝでは、作動長孔20内での中間位置に拘束され、かつその拘束位置に確保されているために、実質上、この偏心輪12が振盪台19の所定位置を占めて回転のみ自在に係合された状態におかれるもので、この状態では、装置基板1に対する中間遊動体15のY方向摺動と、この中間遊動体15に対する振盪台19のX方向摺動とが複合されて、振盪台19を主軸10を中心にした有効半径(r_1)による回転運動、すなわち、旋回振盪運動をさせることができるのである。

また、切換え作動レバー33が往復振盪側切換え点Bに選択切換えられると、一方では、作動長孔20内の偏心輪12に対する作動板24の係合凹部28による係合拘束が解放されて、これらの両者間が離間されており、かつ他方、今度は、装置基板1上の係止ロッド29が作動板24の係止凹部31により位置決め、引寄せされ、かつその引寄せ位置が確保されているために、実質

33を、往復振盪側切換え点B側へ切換え作動させることにより、ガイド凹溝22内の作動板24の矢印a方向への摺動移動に伴つて、まず、振盪台19側にあつては、作動長孔20内の偏心輪12に対する係合凹部28の係止が解放され、これらの両者間が離間され始めると共に、同時に、係止用ガイドカム斜面30の何れかの部分が、装置基板1上の係止ロッド29の少なくとも一部に当接されることになり、その当接面がこの係止ロッド29上でガイドされながら、振盪台19自体を主軸10と係止ロッド29とを結ぶ線上までY方向に引寄せ移動させ、かつ偏心輪12からの係合凹部28の抜出しが果された後、続いて、この係止ロッド29に係止凹部31が一旦、係止されるのであり、このようにして、構めて簡単に往復振盪運動状態へ移行させることができる

また、これとは反対に、前記往復振盪運動状態からの旋回振盪運動への切換え作動については、往復振盪運動での停止位置において、往復振盪側

切換え点Bに保持されている切換え作動レバー33を、旋回振盪側切換え点A側へ切換え作動させることにより、作動板24の矢印b方向への摺動移動に伴ない、係止ロッド29に対する係止凹部31の関係が切離された状態で、たとえ停止時点での引寄せ位置がずれていたとしても、係用ガイドカム斜面27の何れかの部分が、前記と同様に、振盪台19での作動長孔20内の偏心輪12の少なくとも一部に当接されることになり、その当接面が偏心輪12上でガイドされながら、この偏心輪12に係合凹部28を係合させ、かつその係合状態が拘束されて確保し得るのであり、こゝでもこのようにして、極めて簡単に旋回振盪運動状態へ移行させることができるのである。

(発明の効果)

以上詳述したように、本発明によれば、駆動源により所定の有効回転半径で偏心輪駆動される偏心輪、および往復振盪運動方向に直交して配設されるY方向ガイド手段を有する装置基板と、往復振盪運動方向に配設されるX方向ガイド手段を

有して、Y方向ガイド手段によりY方向摺動自在に装架される中間遊動体と、有効回転半径に対応してY方向に穿設され、偏心輪を嵌挿させる作動長孔を有して、X方向ガイド手段によりX方向摺動自在に装架される振盪台と、少なくとも偏心輪を作動長孔内で係合し得るようにした係合凹部を有して、振盪台に対してX方向摺動自在に装着される作動板と、作動板に連繋されて、偏心輪に係合凹部を係合保持、または離脱解放させる作動手段とを備えて構成したから、装置基板に対して振盪台をX、Yの2次元方向へ自由に摺動移動させることができると共に、係合凹部による偏心輪の係合保持によつては、作動長孔内の偏心輪のY方向摺動を阻止して、振盪台に旋回振盪運動を与える、また、係合凹部による偏心輪の離脱解放によつては、作動長孔内の偏心輪のY方向摺動を許容し、かつ中間遊動体のY方向摺動を絶つて、振盪台にX方向の往復振盪運動を与え得て、単なる作動板の選択切換えをなすのみの極めて簡単な操作により、同一の振盪台に対して、旋回振盪運動

または往復振盪運動の2種類の異なる振盪攪拌作用を容易かつ迅速に行なわせることができるもので、従来のように、各別のアタッチメント、あるいは、アタッチメントを付設させた振盪台をそれぞれに用意して、これらを旋回振盪および往復振盪の選択切換えの度毎、一々連繋結合し直して使用する必要などが全くなく、しかも、構造的にも比較的簡単で容易に実施可能であるなどの優れた特長がある。

4. 図面の簡単な説明

第1図は本発明に係る旋回および往復切換え型振盪装置の一実施例による概要構成を旋回振盪状態で示す平面図であり、また、第2図は同上装置構成の側面図、第3図は第1図III-III線部における断面図である。

1 ……装置基板、5 ……モーター、6～11…減速齒車列、10 ……主軸、12 ……偏心輪、13 ……Y方向ガイドロッド、15 ……中間遊動体、16 ……枠板、17 ……X方向ガイドロッド、18 ……Y方向ガイドローラー、19 ……振盪台、20 ……作動長孔、21 ……X方向ガイドローラー、22 ……ガイド凹溝、24 ……作動板、25 ……作動軸ピン、26 ……押え板、27 ……係用ガイドカム斜面、28 ……係合凹部、29 ……係止ロッド、30 ……係止用ガイドカム斜面、31 ……係止凹部、32 ……支点軸ピン、33 ……切換え作動レバー。

A ……旋回振盪側切換え点、B ……往復振盪側切換え点。

r_1 ……偏心輪の回転半径、 $r_2(2r_1 + \Delta r_1)$ ……作動長孔の長径、 Δr_1 ……許容間隙。

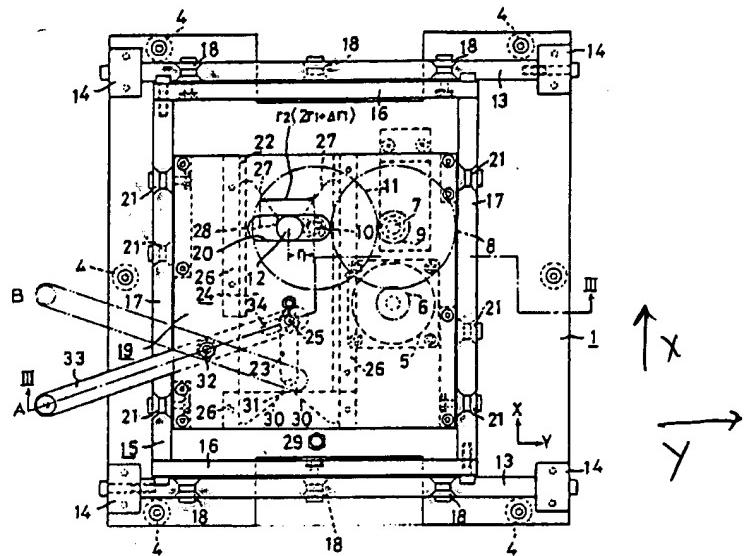
特許出願人 林工業株式会社

株式会社 井内盛栄堂

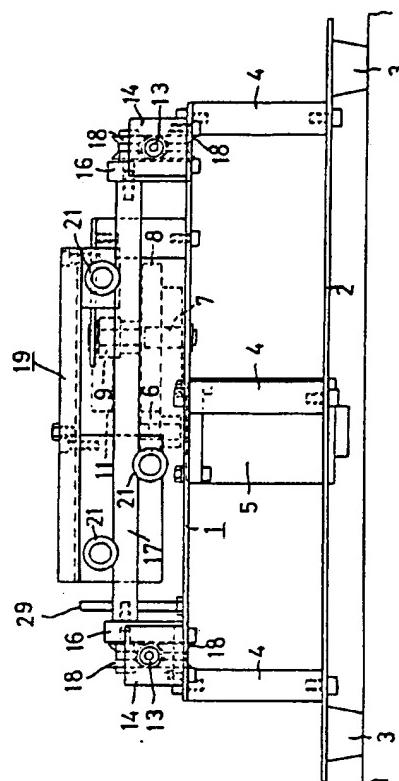
代理人 菅 隆彦



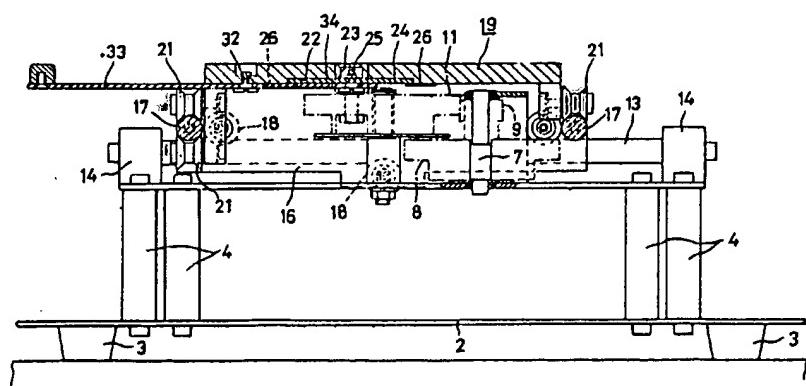
第 1 回



第2回



第3回



PAT-NO: JP402261371A
DOCUMENT-IDENTIFIER: JP 02261371 A
TITLE: TURNING AND RECIPROCATING CHANGEOVER
TYPE SHAKER
PUBN-DATE: October 24, 1990

INVENTOR-INFORMATION:
NAME
UMETSU, TSUKASA

ASSIGNEE-INFORMATION:
NAME COUNTRY
HAYASHI KOGYO KK N/A
KK IUCHI SEIEIDOU N/A

APPL-NO: JP01081900

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ABSTRACT:

PURPOSE: To obtain a shaker both for turning and reciprocating shaking by providing a shaking base with a changeover means from turning shaking to reciprocating shaking for one shaking driving source.

CONSTITUTION: An intermediate floating unit 15 is mounted through guide means in the Y-direction slidingly toward the Y-direction on a device base plate 1 and a shaking pedestal 19 is mounted through guide means in the X-direction slidingly toward the X-direction on the device

base plate 1. An eccentric ring 12 is engaged and inserted into an operation slot 20 perforated in the Y-direction of the shaking pedestal and engaged, held, disengaged or released in the operation slot by the engaging recessed part 28 of an operation plate 24 slidingly mounted in the X-direction on the shaking pedestal.

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